



EML or PML Does It Make A Difference?

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Despite the relevance of loss potential estimation for Property underwriting, no common standard has yet been adopted by the insurance industry as a whole. Underwriters employ a variety of definitions of and methods of determining Estimated Maximum Losses (EMLs) and Probable Maximum Losses (PMLs). In broad terms, the diverse definitions result from differences in the ways in which various levels of fire protection and fire-fighting features are taken into consideration.

1. Historical Development

Initially, all Property underwriting and reinsurance was done on the basis of the total sum insured per policy. However, as industries grew and individual policies were extended to cover more plants, insurers found that they were being compelled to cede too much of their business in the form of reinsurance and/or coinsurance.

Insurers found that they could increase their net retention without endangering their company's share capital by basing their underwriting and net retention first on the highest sum insured per location.

Underwriting Policy was again placed on a more conservative footing, and loss potential estimates were redefined.

The various terms gave rise to the major problem, The definitions are all subjective and open to different interpretations. Despite the obvious advantages of having a single, commonly accepted definition of maximum loss estimation, the LIRMA definition has unfortunately never been generally accepted by the market as it deserved to be. This is because, even today, companies prefer to use their own definitions of EML, PML, MFL, etc. when assessing risks and deciding the size of their net retentions.

2. Consequences of Incorrect Loss Estimates

Estimated Maximum Losses (EMLs) are produced for the use of the underwriter to assist him or her with deciding the size and extent of line to be written and the level of reinsurance required. By writing a share on EML basis, an insurer can write more of the risk, but the consequences of EML failure might be damaging.

A reinsurance programme based on EML is not problematic in itself. Irrespective of how EMLs are defined, however, their calculation is based on a human evaluation of the loss potential entailed in specific risks.

One of the most spectacular errors involving an inaccurate EML calculation was the Flixborough disaster. Despite the fact that the incident took place more than 20 years ago, it continues to be a good example because the damage was so extensive that most insurers and reinsurers still remember what happened on 1 June 1974.

The chemical plant was insured against material damage due to fire or explosion up to an amount of USD 43 million. Leakage led to a devastating explosion which destroyed nearly 80% of the plant. The EML, however, had been estimated at only 20%. The balance of 60% amounted to nearly USD 26 million. In addition to the Property damage, the insured was also protected by a Loss of Profits (LOP) policy with a limit of USD 9 million, for which the EML had been assessed at 60%. However, the LOP loss was 66.5%. Although a small difference in percentage, the balance amounted to USD 1 million. All in all, the insurers and reinsurers had to pay nearly USD 27 million more than had been anticipated when they accepted shares of the risk.

It is obvious that such errors could lead to solvency problems for the parties involved.

3. General Approach to loss estimates

Generally, the Estimated Maximum Loss (EML) or Probable Maximum Loss (PML) is estimated by dividing the risk into complexes. Caution should be exercised in defining



complexes because experience has shown that structural separation in the conventional sense is no longer entirely effective in the event of a loss.

It is necessary to identify the complex with the greatest exposure. Additionally, it should be considered that a fire can also spread to other complexes. The possibility that a fire may spread beyond the complex in which it starts is suggested by the following risk characteristics or events.

- Risk of explosion
- Risk of consequential damage resulting from corrosive gases or vapors
- Risks created by the neighborhood
- Cases of simultaneous arson in several separate complexes
- Disaster-like effects of external factors connected neither directly nor indirectly with the risk insured, e.g. plane crash.

EMLs or PMLs are expressed as a percentage of the total sum insured or in an absolute amount. In order to clarify this issue, the following definitions and assumptions may be taken as a possible guideline in assessing the risk term of EMLs and PMLs.

4. Estimated Maximum Loss

The only definition generally that is recognized today is the one originally proposed by the ROA (which has now been superseded by LIRMA).

4.1 Definition of Estimated Maximum Loss (Fire & Explosion, Material damage only)

An estimate of the monetary loss, which could be sustained by insurers on a single risk as a result of a single fire or explosion, considered to be within the realms of probability. The estimate ignores such remote coincidences and catastrophes as may be possibilities but which still remain unlikely.

4.2 Assumptions and Assessment Criteria

Estimated Maximum Losses (EMLs) are based on a number of assumptions: firstly, that automatic fire-alarm and extinguishing systems (e.g. sprinklers, carbon dioxide and foam systems, etc.) are not in service, or they are non-existent. Secondly, it is also assumed that competent private and public assistance is delayed, and that the fire doors between at least two adjacent fire areas are open. Fire doors that are held open magnetically do not close. Thirdly, it should be assumed that full, sealed firewalls will hold, unless an exceptionally high fire load or evident risk of explosion makes it seem justified to assume otherwise. The separation walls, fire doors included, are constructed to withstand fire for at least two hours. It is also assumed that the risks are exposed to normal circumstances. Abnormal circumstances, which are not taken into account:

- Plane crashes or objects falling from the sky
- Explosion in a vessel due to vapor
- Arson and sabotage.

A standard method for calculating EMLs should consider the following specific risk factors:

- The dimensions and shape of the area potentially exposed to a single fire or explosion
- The construction of roof, walls and floors
- The presence of combustible linings on walls, roofs, ceilings and partitions
- The nature, distribution and combustibility of contents (fire load)
- The use of hazardous processes and substances and the degree to which they are separated
- The susceptibility of the contents to damage by smoke, heat and water



- The risk of explosion (where liquefied petroleum gas, flammable goods and dust are stored/used)
- Any hazards arising from gases or corrosive materials
- Any concentrations of value within a small area
- The standards of management and housekeeping
- The clearance between buildings, with consideration given to design and materials
- The distance to any stocks such as timber, goods, cistern park or liquefied petroleum gas tank
- Any special geographical or meteorological features such as wind conditions.

Factors which should not be included when assessing an EML :

- Any horizontal separations within a building
Fire-resisting doors
- The absence of normal sources of ignition
- The presence or planned installation of fire-detection, prevention or extinguishing systems, including sprinklers, and the adequacy of fire-brigade services.

The existence of such protective installations may merit a higher net retention than that calculated for a similar, unprotected type of risk, but it should be clearly understood that such protective systems may be rendered in-operative and should therefore be disregarded when calculating an EML.

4.3 Fire Loss of Profits

In addition to the principles applied to Fire EMLs, underwriters assessing Fire Loss of Profits EMLs or combined EMLs should also take into consideration the following general aspects:

- Bottlenecks, e.g. key machinery
- Rebuilding or reinstatement period
- Computer dependency, e.g. process computer
- Contingency plans, which should be fully documented, continually updated and, where feasible, validated through testing
- Market situation, recovery of market share
- Dependencies upon suppliers and/or utility companies, e.g. dependence on public utilities
- Interdependencies, e.g. between locations or premises of an insured who owns several operating companies and many sites
- Just-in-time deliveries, e.g. of raw materials, components, parts or finished products
- Off-site exposures from adjacent sites owned by other insureds.

In addition to these general aspects, it is obviously necessary to consider a number of specific questions which vary, depending on the type of company involved, for example whether it is a company that operates on a seasonal basis, whether rental facilities are available and whether it makes extensive use of automation and/or robotics, central warehousing or central computing facilities.

Furthermore, failure to keep off-site copies of specifications and/or drawings for tooling and computer systems records should be considered. Attention should also be paid to workforce availability and construction/ fabrication market conditions. Factors delaying recovery may include requirements for a unique asset, a unique location, critical off-site dependencies or key types of employees.



5. Probable Maximum Loss

After the term EML, the second most commonly used term is Probable Maximum Loss (PML).

5.1 Definition

The PML is defined as the largest estimated loss arising from a single event which was assessed with due care, taking into account all the elements of the risk. In order to estimate the PML for a risk, it is necessary to define a scenario in which a major fire occurs under reasonably adverse conditions. The term reasonably adverse conditions is assumed to mean that the fire occurs in the worst possible place at the worst possible time. An example would be a fire occurring in the middle of a warehouse in the early hours of the morning at a time when the sprinkler system has been shut off for repairs.

5.2 Assumptions & Assessment Criteria

The underlying assumption is that all fire-protection systems and measures, for example automatic sprinkler systems and fire alarms, are ineffective.

The assumptions made for estimating the PML can be summarized as follows:

- Water spray is ineffective against radiant heat
- Water spray is effective in preventing steel from failure
- The sprinkler systems are properly designed but will fail to control fires in areas containing high concentrations of plastics
- Tied walls will remain standing
- The fire brigade is unable to control or extinguish a fire
- The fire brigade is effective in controlling damage from salvage and clean-up procedures
- Highly sensitive facilities and stocks will sustain extensive damage from water and/or smoke
- Offices are considered as an ordinary hazard
- Combustion safeguards on ovens, furnaces and other fired vessels are inoperable.

The factors that are not taken into consideration are basically the same as those described in the EML section.

5.3 Fire Loss of Profit

Underwriters should take into account the following Fire Loss of Profits (FLOP) factors:

- Operations and/or production facilities which can cause total BI
- Operations and/or production facilities which can cause partial BI
- Department(s) whose failure has the most critical effect(s) on profits.

When assessing a FLOP PML, analysts should not reduce the PML because buffer stocks or redundant capacity exists, nor should they include any unusual changes in the company's financial situation or entrepreneurial risk.



HERE under LIRMA Definition of a Single Risk

LIRMA Definition of a Single Risk

A single risk, for this purpose, means any building or range of buildings not separated either:

1. From other buildings by an open space (with no tall grass, timber or any other combustible element) of 15 meters where there are no opposing openings and where the other buildings have external walls of bricks, stone or concrete (reinforced or otherwise) and are roofed with slates, tiles, concrete (reinforced or otherwise) or metal sheeting.
2. From other buildings by an open space (with no combustible element) of 25 meters where there are opposing openings or where the other buildings are of a construction inferior to that defined in 1 above
3. From adjacent property by a perfect party wall of brick, stone or concrete (reinforced or otherwise) of at least 21 centimeters thickness, entirely without opening and extending at least 37 centimeters above the roof of both sides. Where one roof is of concrete, the party wall need not extend above it.

In buildings separated in accordance with 1 or 2, an open-sided covered way, not used for any trade process or for storage, would not be considered as forming communication.

In the case of plants in the open (refineries, chemical factories and the like) or of tank storage, the minimum open space between units or groups of tanks for the purpose shall be 25 meters. In addition, storage tanks must be adequately bonded by container walls sufficient to hold at least 110% of the maximum capacity of the tanks.

Wherever there is sloping ground coupled with a risk which, in the event of fire, could produce burning liquid, regard should be taken of the fact when assessing a single risk, notwithstanding the existence of separations as defined above.

These separations are considered to be adequate to prevent the spread of fire. However, where an inherent explosion hazard exists, a perfect party wall (see 3 above) cannot necessarily be considered adequate separation. Moreover, where highly explosive materials are used, even greater distances are required to provide adequate separation.

Where stocks are insured on a floating or declaration basis, the amount to be taken into account is the loss limit on stocks in the single risk under consideration or, where there is no loss limit, the total sum insured on stocks. Variation of this rule is allowed only in cases Where the maximum value of stocks in the single risk is clearly limited by the capacity of the building or buildings, in which case the amount to be taken into account shall not be less than that related to the maximum capacity.

Prevailing climatic conditions, e.g. strong winds or extreme cold, which could have a material effect on fire spread must also be taken into account in defining single risk. //